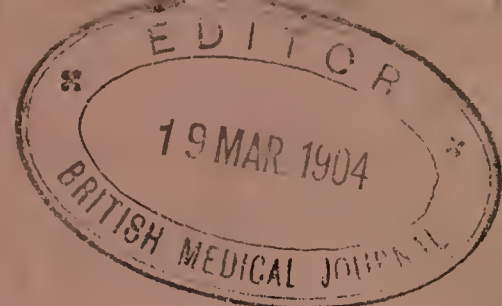


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*Yorkshire*  
West Riding County Council.

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# REPORT

OF THE

## COUNTY MEDICAL OFFICER

ON THE

# WATER SUPPLIES

DERIVED OR DERIVABLE FROM THE

## New Red Sandstone Formation in the West Riding.

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*Presented to the West Riding Sanitary Committee, 14th December, 1903  
(in pursuance of Minute No. 1695, 6th April, 1903).*



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### Part I.

**General Location.**—The New Red Sandstones occupy a large area in the West Midland Counties, extending across Cheshire and South Lancashire to the sea, and also running down by a narrow tongue to the Bristol Channel and Devonshire. The same formation runs Northward from the Midlands right through Yorkshire to the Tees. Roughly speaking, it occupies all that part of the West Riding which lies to the East of a line drawn Northwards from Tickhill to Ulleskelf and North-Westwards from Ulleskelf to Ripon (see Map at the end of this Report).

**Water-bearing Character.**—With regard to the general suitability of the New Red Sandstones as a source of water supply, a great deal of evidence was collected by the Royal Commission on River Pollution in 1868, and it may be well to give at once a few of their conclusions.

*Shallow Wells.*—After stating that these rocks and the porous drift overlying them are a very fertile source of shallow well-waters, and one which has been largely developed in the past, the Report states:—“Nevertheless the sources of pollution surrounding shallow wells are so general, numerous, and potent as to leave but few of the many samples (examined and reported on) of sufficient purity for safe domestic use, although most of them were clear and palatable.”

*Spring Waters.*—“The unpolluted spring waters from the New Red Sandstones are clear, bright, colourless, palatable and wholesome. They contain but a very small quantity of organic matter, and are well adapted for all domestic purposes except washing, for which most of them are too hard.”

*Deep Well Waters.*—“The New Red Sandstone is one of the best water-bearing strata in Great Britain, and many deep wells are sunk into it, from which large volumes of water are raised. The unpolluted waters from deep wells in the New Red Sandstone are almost invariably clear, sparkling and palatable, and are amongst the best and most wholesome waters for domestic supply in Great Britain. They contain as a rule but a moderate amount of saline impurity, and either none or but the merest traces of organic impurity. The hardness is usually moderate, and only when the water is derived from originally impure sources does it become excessive. There is every reason to believe that a vast quantity of hitherto unutilised water of most excellent quality is to be had at a moderate expense from this very extensive geological formation.”

**Area in the West Riding.**—Having given the above references by way of preface, I propose to consider in more detail the New Red Sandstone area in the West Riding, the population residing thereon, and the measures which have been taken or proposed for supplying them with water from this source.

The area with which we are thus concerned is about 440 square miles, but a very large part of this is covered with drift, composed of clays, sands, and gravels, which conceal the formation, so that it only appears at the surface in isolated patches (coloured dark-brown on the Map herewith and marked f 2), of which the following are the chief examples:—

- (1) At Hambleton Hough and Brayton Barff, near Selby, where there is an area of some  $5\frac{1}{2}$  square miles exposed.
- (2) A narrow strip of  $9\frac{1}{2}$  square miles between Beal and Snaith, on which are erected the Pontefract Waterworks and also the Goole New Waterworks.
- (3) A patch of about one-third of a square mile on which the town of Thorne stands.
- (4) Several patches between Armthorpe and Thorne, comprising together about 15 square miles.
- (5) Other patches of larger aggregate area situate between Doncaster and Bawtry.

It will be shown later that these exposed sandstone areas are the points where bore-holes may be made with most advantage, and it would seem that the southern portion of the tract in the West Riding is better provided with these points than the northerly part



**Population.**—The number of people inhabiting the 440 square miles of the West Riding occupied by the New Red Sandstone may be given at about 112,500. The following is a list of the West Riding Sanitary Districts which are wholly or partly embraced within this area, showing approximately the population included. The list is arranged roughly in geographical order from north to south :—

<i>Sanitary District.</i>				<i>Population living (1901) on the New Red Sandstone Formation.</i>
Ripon Rural ( <i>small part</i> )	...	...	...	841
Great Ouseburn Rural ( <i>greater part</i> )	...	...	...	8,858
Wetherby Rural ( <i>small part</i> )	...	...	...	1,408
Bishopthorpe Rural...	...	...	...	1,960
Tadcaster Rural ( <i>part</i> )	...	...	...	2,718
Selby Urban	...	...	...	7,786
Selby Rural	...	...	...	5,822
Goole Urban	...	...	...	16,576
Goole Rural	...	...	...	7,937
Pontefract Rural ( <i>part</i> )	...	...	...	3,725
Hemsworth Rural ( <i>small part</i> )	...	...	...	132
Thorne Rural	...	...	...	7,246
Doncaster Rural ( <i>part</i> )	...	...	...	8,133
Doncaster Borough	...	...	...	28,932
Balby-with-Hexthorpe Urban	...	...	...	6,781
Wheatley Urban	...	...	...	3,580
				<hr/> 112,435 <hr/>

## Part II.—EXISTING WATER SUPPLIES DERIVED FROM THE NEW RED SANDSTONE.

In considering the present water supplies of the West Riding communities living on this formation, it will be well to first dispose of the shallow wells and then refer in more detail to the other existing means of supply.

**Shallow Wells.**—In all the Rural Districts on the list the majority of the villages depend on shallow wells which, speaking generally, fully merit the adverse conclusions arrived at by the Royal Commission, and quoted on the previous page. Such wells are frequently situated in undesirable proximity to dwellings, middens, manure heaps, farm-yards, etc., and even where they have not been positively condemned by the Local or County Medical Officer, their purity is more than doubtful. My reports on the Sanitary Survey of the Rural Districts of Wetherby, Selby, Pontefract, Goole, and Thorne contain detailed descriptions and analyses relating to many such wells.

**Other Supplies.**—Deep wells, however, are not uncommon on this area, borings having been made in numerous localities with various results as regards the quantity and quality of water yielded. In the following list mention is made of some of the principal supplies at present in use on the New Red Sandstone area other than shallow wells :—

**RIPON RURAL.**—Only a very small part of this district is on the Sandstones (population 841). We have no information of any deep borings in this part.

**GREAT OUSEBURN RURAL.**—There is a public artesian well in the market place at Boroughbridge, which is about 256 feet deep, and in recent years quite a number of bore-wells have been put down in other parishes, from which good supplies are obtained. Thus eight bores were sunk in 1900, including two at Poppleton; in 1901 seven other bore-wells were constructed. It should also be mentioned that the Yorkshire Inebriates Act Joint Committee have this year completed a bore-well on their estate at Cattal, in this district. The well itself is 75 feet deep, and the boring is carried to a depth of 200 feet from the surface. Trial pumpings continued for 19 consecutive days and nights, during which the rest-level of the water did not fall below 17 feet from the surface, and the volume of water delivered was as follows :—

Pumps working at 90 lbs. pressure = 79,000 gallons per day.

„ „ „ 85 „ „ = 60,000 „ „

„ „ „ 80 „ „ = 43,000 „ „

The complete cost of the boring and well-sinking was £238 13s. 6d.

**WETHERBY RURAL.**—An artesian well stated to be 200 feet deep, supplying a brewery at Tockwith, is the only example of a deep boring of which we have any note in the small portion of this district which is situate on the New Red Sandstones.

**BISHOPTHORPE RURAL.**—Polluted shallow wells in this district have been largely substituted by the York public water supply, in consequence of pressure by the West Riding Sanitary Committee in 1897. One deep well exists.



TADCASTER RURAL.—A bore-hole at Bilbrough, 240 feet deep, supplies water to the town of Tadcaster, with a population of about 3,000.

SELBY URBAN.—In 1853-4 this district was provided with water from a well and bore-hole in the town, 333 feet deep, from which 243,000 gallons per day were pumped. In 1885 a new bore-hole (close to the old one) was sunk to a depth of 390 feet, and this was deepened in 1894-5 to 674 feet, and gave a yield of 250,000 gallons per day. There are numerous private bore-wells in Selby supplying water for trade purposes, and at the time of the Sanitary Survey (1901) it was ascertained that the yield of water from 10 of the principal wells in the town was 558,000 gallons per day, equal to about 72 gallons per head of the population. The town's supply has, however, been diminishing in recent years, and the District Council sought advice on the matter. Expert opinion attributed the diminution chiefly to the fact that the available area of absorption around Selby is too small to continue to yield so large a quantity as is being pumped there. The remedy suggested consists of making a boring on one of the exposed patches or outcrops situate about  $2\frac{1}{4}$  miles from Selby, and the District Council are now taking steps to that end.

SELBY RURAL.—The villages have generally to rely on shallow wells which are notoriously polluted (see Survey Report). Mr. J. Villiers, Well Engineer, Beverley, has supplied me with details of several bore-wells constructed by him for private persons in this district (see Appendix, pp. 7 and 8). These borings are from 100 to 150 feet deep, lined with tubes down to 60 or 90 feet, and good supplies have been obtained, the water rising to from 4 to 12 feet from the surface.

GOOLE URBAN.—Formerly Goole was supplied from a well at Rawcliffe Bridge, 52 feet deep, but when seeking to augment this supply by deepening the boring, the underlying Marl Beds were pierced, with the result that although the supply became practically inexhaustible the water was rendered hard and turbid. Thereupon the Council, acting upon expert advice, determined to go to one of the outcrop areas already referred to (near Pollington in the Goole Rural District). Here a well was sunk 80 feet deep with a boring down to 215 feet. The trial pumping gave 600,000 gallons per day and I am informed by the Waterworks Manager (Mr. T. E. Franklin) that the present average yield is 420,000 gallons and the population supplied is 17,000. There are a number of private borings in Goole supplying a considerable volume of water for trade purposes.

GOOLE RURAL.—The village of Airmyn is the only one having a public supply and this is pumped from a deep boring into a cistern from which it is served to a population of about 400. There are several other borings in this district belonging to private owners, or serving other districts (see Goole Urban).

PONTEFRACT RURAL (part).—Shallow wells afford the chief source of supply, but there are a number of private borings. It may be mentioned that the Pontefract Corporation Waterworks are situate at Roall in this district (Kellington Parish).

HEMSWORTH RURAL.—Only a very small portion of this district overlies the sandstones and no deep borings are recorded. Several parishes, however, are supplied with water by the Pontefract Corporation derived from their deep borings at Roall.

THORNE RURAL.—There is no public supply in this district except at Thorne, where the filtered Canal water is piped to the public pumps in the town. In 1896, the Authority attempted to improve the supply by sinking a tube well (122 feet) at the north-end of Thorne town. It gave an abundant supply of water which was, however, so cloudy, hard and chalybeate in character that it was little used. The Rural Council have several times taken engineering advice as to providing a supply by boring, and reference will be made to the opinions of the engineers at page 4, under the head of "water supplies derivable." There are quite a number of private bore-wells in the rural district, some of which are referred to in the appendix.

DONCASTER RURAL.—Numerous bore-holes have been sunk in this district from which good private supplies have been obtained. (See appendix for data).

DONCASTER BOROUGH, BALBY-WITH-HEXTHORPE URBAN, WHEATLEY URBAN.—The Doncaster public supply serves these places. It is derived from surface-catchgrounds outside the area under consideration. There are doubtless many deep wells in Doncaster used for trade purposes. Particulars of a bore-well in the Balby district are given in the appendix.



**Outside Districts supplied from New Red Sandstones.**—It only remains to mention a few West Riding communities not located on this formation but obtaining their supply therefrom. These are Pontefract Borough, Knottingley Urban District, and the parishes of Ackworth and Kirk Smeaton in the Hemsworth Rural District. All these places are supplied from the waterworks of the Pontefract Corporation which are situate at Roall, 7 miles to the east of the borough.

The case of Tadcaster comes in the same category. The town is situate just off the sandstones and is supplied from a 240 feet boring at Bilbrough.

### Part III.—**WATER SUPPLIES DERIVABLE FROM THE NEW RED SANDSTONES.**

In carrying out the Committee's instruction to report on this phase of the subject, all that is necessary is to record a few opinions of geological experts, consulting engineers, or Local Government Board Inspectors who have investigated this matter from time to time.

**Shallow Wells and Springs.**—These may be here left out of account, the first because of the general condemnation, and the second in view of the low-lying flat character of the greater portion of the New Red Sandstone tract in the West Riding. In some of the northerly parts, however, springs might be made use of. Dr. C. E. Lownds (Medical Officer of Health for the Great Ouseburn Rural District) has for several years pointed out that there are some excellent springs in the parishes of Low Dunsforth and Aldborough, of such capacity as would, in his opinion, supply the whole of that Rural District.

**Deep borings.**—If therefore a satisfactory supply is to be obtained from underground sources it is to the deep well waters of this formation that most of the communities living thereon must look.\* The capacity of the New Red Sandstones to furnish vast quantities of excellent water at moderate cost, is not only vouched for by the Royal Commission of 1868, and by a large volume of subsequent expert opinion, but it is supported by the actual experience in connection with waterworks already constructed.

Mr. Geo. Hodgson, C.E., of Westminster and Loughborough, in advising the Pontefract Corporation in 1886, stated that "In the geological formation referred to there can be no doubt that at suitable points water may be obtained in very large volumes at low cost, "sufficient to supply Knottingley, Pontefract, Ferrybridge, Carleton, Ackworth, Featherstone, "Purston, Streethouse, Glass Houghton, Sharlston, and, if necessary, Castleford." In a subsequent report the same Engineer said (1887):—"The whole body of the rock is saturated "with water and the quantity obtainable is to a great extent a question of the depth of "sinking." Pontefract acted on the advice obtained, and at the present moment the Corporation are supplying a considerable population with a satisfactory water. Their works are situate at Roall on one of the patches referred to on page 1, where the New Red Sandstones rise through the post-tertiary beds.

The Goole Urban Council, as already mentioned, have recently gone to the same area, and secured an average daily yield of 420,000 gallons. Selby, in like manner, are about to act on the advice of Mr. Kendall and Mr. Percy Griffiths to augment their present supply by boring at or near the outcrop at Brayton Barff or Hambleton Hough.

Outside the West Riding experience runs in the same direction, viz., that borings at or near the outcrop afford satisfactory results at comparatively small depths. Thus the Retford Corporation, acting under skilled advice, some ten years ago, sought a suitable place for a boring at a distance of eleven miles from the town, where a supply was obtained at a depth of only 73 feet. Gainsborough on the other hand has made borings close by the town, although they are situate some 7 miles from the outcrop. Here they have had to sink great depths to reach the pebble beds, one bore being 1100 feet and the other 1515.

By the kindness of numerous engineers, officials, and private owners I have been supplied with details of borings in various localities, all supporting the same general statement that the further from the outcrop, the deeper the boring required. In order to keep this report within reasonable limits, I refrain from giving these details here, but in the appendix will be found particulars of many such bore-holes. Fortunately, the question of depth of boring is much simplified, so far as the West Riding is concerned, by the existence (particularly in the southern part) of the convenient exposed patches of the new red sandstones (f 2) referred to on page 1. As already mentioned, it is to such places that several Authorities have gone with success (Pontefract, Goole, Tadcaster, Retford) and that others have been advised to go (Selby, Thorne). Thus Messrs. Fairbank, in advising the Thorne Rural Council, suggest boring 200 feet at Thorne or 150 at Hatfield, and they point out that to endeavour to tap the lower pebble beds would necessitate great expense and would not ensure a supply of such good

\* In this report I have not considered the relative advantages of supplies from other than underground sources, nor have I concerned myself with speculations as to the remote future of the Sandstones, *e.g.* as affected by possible Coal-mines. J.R.K.

quality as that obtainable from a comparatively shallow bore into the sandstone rock at Hatfield. Mr. C. Fox Strangeways, of the Government Geological Office, recently gave his opinion that "these beds may be expected to furnish a fair supply, say 400,000 gallons a day," and Dr. R. J. Reece, of the Local Government Board, is "inclined to think that a well and boring on or near this outcrop would afford the best prospect of obtaining a satisfactory supply of water."

**Conclusion.**—It is quite unnecessary for me to add to the foregoing opinions as to the water supplies *derivable* from this formation. All that remains for me to do is to express my thanks to those gentlemen who have supplied me with some of the valuable data appearing in the appendix, and whose names are given there. I am particularly indebted to Mr. County Councillor Dunston, M.I.M.E., of Thorne, Mr. J. Villiers, of Beverley, and Messrs. Thistlewood, of Doncaster.

A large office map has been prepared showing the whole of the new red sandstone area in the West Riding and the position of the chief borings thereon. To assist in the reading of this report a small-scale map is inserted at the end, giving roughly the same information.

JAMES ROBT. KAYE,  
*County Medical Officer.*

Wakefield,  
November, 1903.



APPENDIX.

Geological Data concerning various deep borings in the  
New Red Sandstones.

N.B.—The numbers in Column 1 correspond with the numbers shown in red on the Map.

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.								
		Description.	Thickness.		Depth to Base.									
			Ft.	in.	Ft.		In.							
1	Cattal (Gt. Ouseburn R.)	Soil	...	1	0	1	0	Inebriates Home, 1903						
		Boulder clay	...	17	0				18	0				
		Sandstone, New red	...	184	0						202	0		
2	Bilborough (Tadcaster R.)	Clay	...	30	0	30	0	Tadcaster Public Supply, 1903						
		Red sandstone	...	66	0				96	0				
		Sandstone, variegated	...	145	0						241	0		
3	Cawood (Selby R.)	Sand	...	3	0	3	0	Steam Flour Mill						
		Clay	...	57	0				60	0				
		Quicksand	...	30	0						90	0		
		Sand. red	...	4	0								94	0
		Sandstone, soft	...	240	0									
4	Selby	Warp	...	6	0	6	0	Public Waterworks, 1885						
		Warpy clay	...	4	0				10	0				
		Very compact clay in layers	...	13	0						23	0		
		Sand in clay in layers	...	1	6				24	6				
		Fine sand like silt	...	2	6						27	0		
		Clay	...	26	0				53	0				
		Quicksand	...	3	0						56	0		
		Hard pan sand	...	19	0				75	0				
		Sandstone	...	4	0						79	0		
		Marl	...	0	3				79	3				
		Sandstone (soft at bottom)	...	42	3						121	6		
		Clay	...	1	0				122	6				
		Soft sandstone and marl	...	5	6						128	0		
		Very fine sand	...	5	0				133	0				
		Sandstone	...	47	0						180	0		
		Marly sandstone	...	73	0				253	0				
		Hard clean sandstone	...	37	0						290	0		
		Marly sandstone (hard)	...	25	0				315	0			—Supply of 1854 taken from depth of 330 feet. 6½ in. bore produced 243,000 gallons per day	
		Hard clean Sandstone	...	16	6						331	6		
		Marl	...	1	0				332	6				
		Soft sandstone	...	16	0						348	6		
		Soft red marl	...	0	6				349	0				
		Hard sandstone	...	26	0						375	0		
		Soft red marl	...	0	6				375	6				
		Clean sandstone...	...	5	0						380	6		
		Soft red marl	...	0	4				380	10				
		Hard marly sandstone	...	9	2						390	0		—Supply of 1885 taken from depth of 390 feet, 12½ in. bore
		Sandstone	...	90	0			480	0					
		Marl	...	8	0					488	0			
		Sandstone	...	54	0			542	0					
		Marl	...	7	6					549	6			
		Sandstone	...	5	4			554	10					
		Marl	...	3	2					558	0			
		Sandstone	...	5	0			563	0					
		Marl	...	1	6					564	6			
		Sandstone	...	3	6			568	0					
		Marl	...	1	0					569	0			
		Sandstone	...	17	0			586	0					
		Marl	...	1	0					587	0			
		Red rock	...	25	0			612	0					
		Red marl	...	1	0					613	0			
		Red rock	...	7	0			620	0					
		Red marl	...	1	0					621	0			
		Red rock	...	31	0			652	0					
		Red marl	...	1	0					653	0			
		Grey rock	...	2	0			655	0			—Supply of 1895 taken from depth of 674 feet, yielding 250,000 gallons per diem		
		Red marl	...	19	0					674	0			



No.	Location of Boring. — Parish.		STRATA PASSED THROUGH.				Remarks.				
			Description.	Thickness. Ft. in.		Depth to Base. Ft. in.					
5	Selby	...	Yellow warp ...	11	0	11	0	Scott's Mill, 1887			
		Blue warp ...	46	0	57	0					
		Yellow warp and sand ...	3	0	60	0					
		Land sand ...	33	6	93	6					
		Hard sand ...	15	0	108	6					
		Marl ...	1	0	109	6					
		Red sandstone ...	4	0	113	6					
		Marl ...	0	6	114	0					
		Red sandstone ...	15	0	129	0					
		Marl ...	0	3	129	3					
		Sandstone ...	60	0	189	3					
		6	Selby	...	Top soil ...	2	0		2	0	Dent & Co.'s boring  (Water level 6 feet from surface)
Sandy warp ...	5			0	7	0					
Blue clay ...	10			0	17	0					
Peat ...	1			0	18	0					
Blue clay ...	6			0	24	0					
Peat ...	2			0	26	0					
Gravel ...	1			6	27	6					
Warp clay ...	15			0	42	6					
Running sand ...	16			0	58	6					
Rock sand ...	11			0	69	6					
Red sandstone ...	17			0	86	6					
Red marl ...	1			0	87	6					
Red sandstone ...	6			0	93	6					
Red marl ...	1			6	95	0					
Red sandstone ...	28			0	123	0					
7	Brayton (Selby R.)			...	Top soil ...	8	0	8	0	Brayton Vicarage, 1902  (Tubed with 3 inch tubing to 84 feet. Water level 12 feet from surface.)	
				Warp clay ...	10	0	18	0			
		Sandy warp ...	6	0	24	0					
		Running sand ...	20	0	44	0					
		Rock sand ...	10	0	54	0					
		Red sandstone ...	68	0	122	0					
		8	Burn ... (Selby R.)	...	Made ground ...	1	0	1	0		Henwick Hall, 1888
Black peat ...	1			6	2	6					
Black sand ...	2			0	4	6					
Warp ...	1			0	5	6					
Strong clay ...	20			0	25	6					
Sand ...	9			6	35	0					
Clay ...	25			0	60	0					
Sand ...	6			0	66	0					
Pan sand ...	10			0	76	0					
Sandstone ...	15			0	91	0					
Red marl ...	1			0	92	0					
Sandstone ...	37			0	129	0					
Red marl ...	1			0	130	0					
Sandstone ...	28			0	158	0					
9	Burn ... (Selby R.)			...	Top soil ...	1	0	1	0	Henwick Cottages, 1888	
		Sand ...	3	0	4	0					
		Clay ...	8	0	12	0					
		Sand ...	19	0	31	0					
		Clay ...	24	0	55	0					
		Sand ...	6	0	61	0					
		Sand and pebbles ...	4	0	65	0					
		Pan sand ...	33	0	98	0					
		Soft sandstone ...	3	0	101	0					
		Sandstone ...	35	0	136	0					
		Marl ...	1	0	137	0					
		Sandstone ...	21	8	158	8					
		10	Barlow (Selby R.)	...	Top soil ...	2	0	2	0		Barlow Grange, 1888
Clay ...	56			0	58	0					
Sand ...	10			0	68	0					
Pan sand ...	6			0	74	0					
Red sandstone ...	59			0	133	0					

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.	
		Description.	Thickness.		Depth to Base.		
			Ft.	in.	Ft.		in.
11	Long Drax (Selby R.)	...	Top soil	...	4	0	Langrick Well. 1899
		...	Clay warp	...	12	0	
		...	Sandy warp	...	8	0	
		...	Green sand warp	...	22	0	
		...	Brown warp	...	7	0	
		...	Dark warp	...	5	0	
		...	Dark sand	...	10	0	
		...	Red marl sand	...	30	0	
		...	Sandstone	...	72	0	
12	Gateforth (Selby R.)	...	Top soil	...	1	0	Mr. Barras' Farm, 1902  (Tubed with 3 inch tubing to 66 feet. Water level four feet from surface)
		...	Sand	...	9	0	
		...	Warp clay	...	12	0	
		...	Dark sand	...	5	0	
		...	Warp clay	...	14	0	
		...	Red sand	...	9	0	
		...	Red sandstone	...	74	0	
		...					
13	Carlton (Selby R.)	...	Running sand	...	19	0	Carlton Towers, 1895  (Not a very hard good stone)
		...	Pan sand	...	31	0	
		...	Red marl	...	2	0	
		...	Sandstone	...	5	0	
		...	Marly sandstone	...	33	0	
		...	Soft sandstone	...	10	0	
		...	Harder stone	...	50	0	
14	Airmyn (Goole R.)	...	Top soil	...	1	6	1884
		...	Sand	...	7	6	
		...	Black peat	...	1	6	
		...	Clay and warp	...	29	0	
		...	Dark sand	...	15	0	
		...	Pan sand	...	46	0	
		...	Sandstone	...			
15	Hook... (Goole R.)	...	Warp	...	2	0	1886
		...	Sandy warp	...	17	0	
		...	Sand	...	11	0	
		...	Clay	...	1	0	
		...	Gravel	...	12	0	
		...	Blue marl	...	16	0	
		...	Do.	...	3	0	
...	Red marl	...	4	0			
16	Goole...	...	Warp	...	4	4	Trial boring for Waterworks  Boothferry Road, Goole
		...	Warp	...	0	6	
		...	Peat	...	0	6	
		...	Fine stiff clay	...	6	8	
		...	Red clay	...	5	0	
		...	Rough gravel	...	8	0	
		...	Warp	...	3	0	
		...	Red sand	...	6	0	
		...	Hard coarse light red sand	...	24	0	
		...	Red marl	...	10	0	
		...	Hard sand	...	11	0	
		...	Red marl	...	3	0	
		...	Hard sand	...	26	0	
		...	Red marl	...	1	0	
		...	Hard sand	...	61	0	
		...	Red marl	...	3	0	
		...	Hard coarse sandstone with small pebbles	...	3	0	
		...	Red sand and marl mixed	...	84	0	
		...	Red sand	...	22	0	
		...	Stiff red marl	...	2	2	
		...	Marl and red sand	...	22	1	
		...	Red sandy marl...	...	59	9	



No.	Location of Boring. — Parish.		STRATA PASSED THROUGH.				Remarks.		
			Description.	Thickness.		Depth to Base.			
				Ft.	in.	Ft.		in.	
17	Goole	...	Top sand ...	...	4	0	4	0	Pemberton's Brewery
			Peat ...	...	2	0	6	0	
		Drift 75 feet	Clay ...	...	22	0	28	0	
			Gravel ...	...	7	0	35	0	
			Red clay ...	...	5	0	40	0	
			Sand ...	...	6	0	46	0	
			Hard sand ...	...	10	0	56	0	
			Gravel and sand	...	9	0	65	0	
			Clay and cobbles	...	10	0	75	0	
			Red sandstone ...	...	125	0	200	0	
18	Goole	...	Sand and clay ...	...	15	0	15	0	Plenty of good water
			Sandstone, soft ...	...	36	0	51	0	
19	Goole Fields (Goole R.)	...	Made ground ...	...	1	0	1	0	White House Farm, 1903 (water level 8 feet from surface)
			Yellow sand ...	...	6	0	7	0	
			Warp ...	...	4	0	11	0	
			Peat ...	...	0	6	11	6	
			Warp clay ...	...	24	0	35	6	
			Sandy warp ..	...	21	0	56	6	
			Sand and gravel	...	3	0	59	6	
			Rock sand ...	...	12	0	71	6	
			Red sandstone ...	...	29	6	101	0	
20	Goole	...	Warp clay ...	...	30	0	30	0	Percy Lodge, 1902 (water level 5 feet from surface)
			Running sand ...	...	10	0	40	0	
			Rock sand ...	...	10	0	50	0	
			Sandstone ...	...	62	0	112	0	
21	Reedness (Goole R.)	...	Dark Soil ...	...	1	6	1	6	
			Yellow sandy warp	...	3	3	4	9	
			Dark blue warp	...	4	6	9	3	
			Fine blue warp	...	6	0	15	3	
			Blue sandy warp	...	6	0	21	3	
			Light grey sand, with water	...	9	0	30	3	
		Drift 69 feet, 8 ins.	Black moor earth with rotten wood	...	11	9	42	0	
			Strong blue clay	...	3	3	45	3	
			Grey sand, with water	...	0	9	46	0	
			Black gravel and quicksand, very sharp	...	10	3	56	3	
			Red sand ...	...	1	5	57	8	
			Grey sand and gravel	...	5	4	63	0	
			Red sand ...	...	3	4	66	4	
			Gravel and sharp sand	...	3	4	69	8	
			Red marl with grey specks	...	3	2	72	10	
			Red sandstone with alabaster and some thin hard lists	...	8	1	80	11	
			Strong blue stone with thin white beds	...	9	2	90	1	
			Dark red bind with white beds of alabaster	...	18	3	108	4	
			Strong blue stone	...	1	8	110	0	
			Red bind with thin beds of blue stone	...	10	3	120	3	
		Blue stone	...	4	10	125	1		
		Red bind with thin white beds and hard lists of blue stone	...	8	6	133	7		
		Blue bind	...	2	0	135	7		
		Red bind with thin hard lists of blue stone and thin beds of alabaster	...	7	7	143	2		
		Red stone	...	8	8	151	10		
		Red bind with hard lists of stone and white alabaster	...	16	10	168	8		
		Blue stone	...	4	4	173	0		

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.				
		Description.	Thickness.		Depth to Base.					
			Ft.	in.	Ft.		in.			
21	Reedness, continued	Red bind with thin beds of alabaster ...	17	11	190	11				
		Blue bind ...	1	9	192	8				
		Red bind with thin beds of alabaster ...	6	8	199	4				
		Blue stone and white partings	0	2	199	6				
		Red stone and blue lists in it	19	8	219	2				
		Red bind with thin beds of alabaster ...	22	6	241	8				
		Red stone ...	5	6	247	2				
		Blue stone ...	4	0	251	2				
		Red bind with hard lists of stone and white partings ...	6	6	257	8				
		Red stone with thin white partings ...	5	6	263	2				
		Blue stone with thin beds and blue bind partings ...	6	6	269	8				
		Blue bind with thin beds of blue stone ...	16	6	286	2				
		Red bind with thin beds of alabaster ...	11	0	297	2				
		Blue bind with soft beds of alabaster ...	8	3	305	5				
		Dark soft red bind ...	32	5	337	10				
		Blue stone ...	4	0	341	10				
		Red sandstone soft at top and gets harder lower down ...	169	6	511	4				
		Red bind ...	2	0	513	4				
		Red sandstone ...	16	6	529	10				
		Red bind with lists of blue stone ...	3	6	533	4				
		Red sandstone ...	233	6	766	10				
		Red bind with bright shining specks ...	3	2	770	0				
		Dark red bind ...	2	10	772	10				
		Red sandstone ...	11	6	784	4				
		Dark red bind ...	1	0	785	4				
		Red sandstone ...	19	6	804	10				
		Red bind ...	2	3	807	1				
		Red stone ...	74	3	881	4				
		Red bind ...	1	0	882	4				
		Red stone ...	24	6	906	10				
		Soft red bind ...	3	10	910	8				
		Red sandstone ...	20	2	930	10				
		Dark red bind ...	1	0	931	10				
		Red sandstone ...	24	0	955	10				
		Dark red bind ...	1	3	957	1				
		Red sandstone ...	38	3	995	4				
		Light red sandstone ...	3	0	998	4				
		Red sandstone ...	30	8	1029	0				
		21A	Kellington (Pontefract R.)	Drift sand and gravel ...	15	0		15	0	Pontefract Waterworks (Roall)
				New Red Sandstone ...	205	0		220	0	
22	Pollington (Goole R.)	Soil ...	2	0	2	0	Goole Public Supply, average yield 420,000 gallons per day			
		Sand ...	10	0	12	0				
		Soft red sandstone ...	34	0	46	0				
		Red marl ...	1	4	47	4				
		Red sandstone ...	32	8	80	0				
		Fine red sandstone ...	31	6	111	6				
		Marly sandstone ...	0	6	112	0				
		Fine red sandstone ...	20	6	132	6				
		Marly sandstone ...	6	6	139	0				
		Fine red sandstone ...	11	0	150	0				
		Grey marl ...	1	0	151	0				
		Red sandstone ...	21	0	172	0				
		Grey marl ...	6	6	178	6				
		Fine red sandstone ...	42	6	221	0				



No.	Location of Boring. — Parish.		STRATA PASSED THROUGH.				Remarks.
			Description.	Thickness.		Depth to Base.	
		Ft.		in.	Ft.	in.	
23	Snaith (Goole R.)	...	Top clay	...	7	0	Bever Bridge
		...	Warp clay	...	14	0	
		...	Grey sand	...	8	0	
		...	Gravel	...	1	0	
		...	Running sand	...	10	0	
		...	Pan sand	...	7	0	
		...	Red marl	...	22	0	
		...	Red sand	...	1	0	
		...	Red sandstone	...	30	0	
		...	Sandstone	...	34	0	
		...	Red Marl	...	6	0	
		...	Sandstone	...	17	6	
		24	Rawcliffe Bridge (Goole R.)	...	Soil	...	
...	Sand			...	9	0	
...	Clay			...	22	6	
...	Sand, gravel and boulders			...	3	0	
...	Sandstone			...	325	6	
...	Red marl			...	4	0	
...	Sandstone			...	30	0	
...	Marl			...	2	0	
...	Sandstone			...	25	0	
...	Marl			...	27	0	
...	Sandstone			...	275	0	
...	Marl			...	3	0	
...	Sandstone			...	72	0	
...	Marl			...	7	0	
...	Sandstone			...	88	0	
...	Grey rock			...	1	0	
...	Marl			...	5	0	
...	Sandstone			...	20	6	
...	Marl			...	3	6	
...	Sandstone			...	11	0	
...	Marl			...	4	0	
...	Sandstone			...	57	0	
...	Marl			...	3	0	
25	Rawcliffe (Goole R.)	...	Soil and sand	...	4	0	1888
		...	Strong clay	...	23	0	
		...	Sand	...	15	0	
		...	Pan sand	...	18	0	
		...	Soft sandstone	...	125	0	
		...	Red marl	...	2	0	
		...	Soft sandstone	...	11	0	
		...	Marl	...	1	0	
		...	Sandstone	...	30	0	
		...	Red Marl	...	1	0	
		...	Sandstone	...	33	0	
		26	Rawcliffe (Goole R.)	...	Soil and sand	...	
...	Warp clay			...	23	0	
...	Sand and gravel...			...	15	0	
...	Pan sand			...	18	0	
...	Soft sandstone			...	54	0	
...	Red marl			...	1	0	
...	Marly stone			...	10	0	
...	Red sandstone			...	110	0	
...	Red marl			...	1	0	
...	Red sandstone			...	50	0	
...	Coarse red sandstone			...	24	0	
...	Hard red stone			...	1	0	
...	Sandstone			...	20	0	

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.		
		Description.	Thickness.		Depth to Base.			
			Ft.	in.	Ft.	in.		
27	Rawcliffe (Goole R.)	Made ground	...	3	6	3	6	Sugar Works, 1889
		Warp	...	20	0	23	6	
		Sand	...	8	0	31	6	
		Gravel and sand	...	6	0	37	6	
		Pan sand	...	10	0	47	6	
		Red sandstone	...	78	0	125	6	
		Red marl	...	1	6	127	0	
		Red sandstone	...	20	0	147	0	
		Red marl	...	1	0	148	0	
		Red sandstone	...	106	0	254	0	
28	Rawcliffe (Goole R.)	Made ground	...	3	6	3	6	Royal Hotel
		Warp	...	30	0	33	6	
		Sand	...	10	0	43	6	
		Gravel	...	6	0	49	6	
		Pan sand	...	10	0	59	6	
		Soft red sandstone	...	60	6	120	0	
29	Thorne (Thorne R.)	Warp clay	...	25	0	25	0	Moorend Cottages, 1903 (water level 3 feet from surface)
		Sand	...	12	0	37	0	
		Strong clay	...	10	0	47	0	
		Sand and gravel	...	12	0	59	0	
		Red sand	...	5	0	64	0	
		Red sandstone	...	48	0	112	0	
30	Thorne (Thorne R.)	Peat	...	17	0	17	0	Moorend
		Sand	...	10	0	27	0	
		Clay, sand and gravel	...	29	0	56	0	
		Sandstone	...	28	0	84	0	
31	Fenwick (Doncaster R.)	Top soil	...	2	0	2	0	Went Farm 1902 (water level 8 feet from surface)
		Sandy clay	...	19	0	21	0	
		Sand and gravel	...	31	0	52	0	
		Rock sand	...	10	0	62	0	
		Red sandstone	...	46	0	108	0	
32	Fenwick (Doncaster R.)	Loamy clay	...	16	0	16	0	Ladythorpe Farm, 1903 (water level 8 feet from surface)
		Do. (soft)	...	8	0	24	0	
		Gravel and sand	...	3	0	27	0	
		Fine sandy warp	...	5	0	32	0	
		Clay, stones, and sand	...	8	0	40	0	
		Blue clay	...	30	0	70	0	
		Clay and stones	...	5	0	75	0	
		Sand	...	2	0	77	0	
		Clay	...	13	0	90	0	
		Gravel	...	1	0	91	0	
		Clay	...	3	0	94	0	
		Soft sandstone	...	56	0	150	0	
33	Moss ... (Doncaster R.)	Warp clay	...	20	0	20	0	1895
		Sand	...	7	0	27	0	
		Strong clay	...	10	0	37	0	
		Shaly clay	...	10	0	47	0	
34	Moss ... (Doncaster R.)	Clay	...	22	0	22	0	
		Sandy clay	...	2	0	24	0	
		Rough gravel	...	1	0	25	0	
		Rough sand	...	25	0	50	0	
		Sand clay	...	20	0	70	0	
		Rubble stone	...	10	0	80	0	
35	Thorne (Thorne R.)	Alluvial deposit	...	16	0	16	0	Brewery
		Sandstone (bunter)	...	284	0	300	0	



No.	Location of Boring. — Parish.		STRATA PASSED THROUGH.				Remarks.		
			Description.	Thickness.		Depth to Base.			
				Ft.	in.	Ft.		in.	
36	Thorne (Thorne R.)	...	Earth and sand ...	...	3	0	3	0	Clifton Lodge
		...	Strong clay ...	...	3	6	6	6	
		...	Sand and marl ...	...	25	6	32	0	
		...	Sandstone ...	...	22	0	54	0	
37	Stainforth (Thorne R.)	...	Sand ...	...	9	0	9	0	Grange, 1895 (plenty of good water)
		...	Gravel ...	...	4	0	13	0	
		...	Sandstone ...	...	46	0	59	0	
		...	Sandstone (light) ...	...	19	0	78	0	
38	Hatfield (Thorne R.)	...	Sand ...	...	17	0	17	0	Five boreholes (plenty of good water)
		...	Sand and gravel ...	...	9	0	26	0	
		...	Sandstone red ...	...	7	0	33	0	
		...	Sandstone green ...	...	41	0	74	0	
39	Hatfield (Thorne R.)	...	Sand ...	...	13	0	13	0	Woodhouse, 1891 (plenty of water)
		...	Sandstone ...	...	54	0	67	0	
40	Hatfield (Thorne R.)	...	Sand ...	...	11	0	11	0	Woodhouse Grange, 1901 (good supply of good water)
		...	Sandstone ...	...	28	0	39	0	
41	Arksey (Doncaster R.)	...	Sand ...	...	6	6	6	6	Plough Inn, 1903
		...	„ yellow and clay ...	...	6	0	12	6	
		...	„ brown ...	...	7	6	20	0	
		...	Clay ...	...	1	6	21	6	
		...	Sand ...	...	3	6	25	0	
		...	„ and gravel ...	...	19	0	44	0	
		...	„ and clay ...	...	3	0	47	0	
		...	Clay blue (with coal 1 inch) ...	...	8	0	55	0	
		...	„ (with sand) ...	...	4	6	59	6	
		...	Sand variegated... ..	...	12	6	72	0	
		...	„ clay and small coal ...	...	10	9	82	9	
		...	„ dark grey ...	...	11	0	93	9	
		...	„ „ (clay and coal) ...	...	8	9	102	6	
		...	„ fine ...	...	13	6	116	0	
		...	Clay hard ...	...	8	0	124	0	
		...	Sand ...	...	4	4	128	4	
		...	Clay with little coal ...	...	4	2	132	6	
		...	„ dark blue ...	...	1	6	134	0	
		...	„ and gravel... ..	...	2	0	136	0	
		...	„ „ with little coal ...	...	6	6	142	6	
...	Sandstone hard ...	...	4	6	147	0			
...	Gravel light ...	...	4	0	151	0			
42	Bentley (Doncaster R.)	...	Sand ...	...	22	0	22	0	(1900)
		...	Clay ...	...	3	0	25	0	
		...	Sand, light ...	...	6	0	31	0	
		...	Sandstone, soft ...	...	8	0	39	0	
		...	„ very soft ...	...	3	0	42	0	— good stream of water
		...	„ dark red ...	...	16	0	58	0	
		...	„ hard, light ...	...	3	0	61	0	
		...	„ light ...	...	11	0	72	0	
43	Armthorpe (Doncaster R.)	...	Soil ...	...	6	0	6	0	Plenty of good water
		...	Clay ...	...	13	0	19	0	
		...	Sandstone ...	...	20	0	39	0	
44	Kirk Sandal (Doncaster R.)	...	Clay ...	...	4	0	4	0	Sandal Beat, 1894 (water level 3 feet from surface)
		...	Gravel ...	...	16	0	20	0	
		...	Pan sand ...	...	22	0	42	0	
		...	Sandstone ...	...	78	0	120	0	

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.			
		Description.	Thickness.		Depth to Base.				
			Ft.	in.	Ft.	in.			
45	Balby - with - Hexthorpe	Top soil	...	...	1	6	1	6	Balby Carr, 1890
		Peat	...	...	0	6	2	0	
		Warp	...	...	8	0	10	0	
		Clay	...	...	3	0	13	0	
		Sand	...	...	8	0	21	0	
		Pan sand	...	...	20	0	41	0	
		Marl	...	...	1	0	42	0	
		Pan sand	...	...	12	0	54	0	
		Marl	...	...	1	0	55	0	
		Pan sand	...	...	5	0	60	0	
		Marl	...	...	0	6	60	6	
		Pan sand	...	...	1	0	61	6	
		Marl	...	...	10	0	71	6	
46	Cantley (Doncaster R.)	Earth	...	...	2	0	2	0	Vicarage, 1896 (a good supply of water)
		Sand and gravel	...	...	25	0	27	0	
		Sandstone	...	...	62	0	89	0	
47	Rossington (Doncaster R.)	Sand	...	...	15	0	15	0	1900 (a supply of good water)
		Sand and gravel...	...	...	7	0	22	0	
		Sandstone	...	...	53	0	75	0	
		Sandstone, soft	...	...	56	0	131	0	
48	Rossington (Doncaster R.)	Sand	...	...	6	0	6	0	Hunster Grange, 1901 (a supply of good water)
		Clay	...	...	94	0	100	0	
		Sand and gravel...	...	...	29	0	129	0	
49	Austerfield (Doncaster R.)	Sand	...	...	19	0	19	0	(Plenty of good water, 1902)
		Sandstone, red	...	...	88	0	107	0	

## OUTSIDE THE WEST RIDING :—

50	Newton-on-Ouse (North Riding)	Top soil ...	1	0	1	0	March, 1888. (Water level 32 feet from surface)
		Red clay ...	3	0	4	0	
		Warp ...	7	0	11	0	
		Sand ...	25	0	36	0	
		Sand and warp ...	20	0	56	0	
		Warpy clay ...	16	0	72	0	
		Yellow clay ...	1	0	73	0	
		Light sandstone... ..	17	0	90	0	
		Soft red sandstone ...	24	6	114	6	
		Red marl ...	0	6	115	0	
		Soft sandstone ...	105	0	220	0	
51	York City	Drift 44 ft. { Red sand ...	7	0	7	0	North Riding Lunatic Asylum Water stands 17 ft. from the surface after pumping at the rate of 7,000 gallons per hour; 70,000 gallons per day have been pumped without lowering the water level
		Peat ...	1	0	8	0	
		Blue clay ...	13	0	21	0	
		Boulder drift ...	23	0	44	0	
		Red sand ...	10	0	54	0	
		Soft red sandstone and layers of grey marl (slate) ...	16	0	70	0	
		White sandstone ...	23	0	93	0	
		Red sandstone with quartz, pebbles, and layers of red clay and soft slate ...	25	0	118	0	
		White sandstone ...	10	0	128	0	
		Red clay ...	0	6	128	6	
		Red sandstone ...	20	0	148	6	
		White sandstone ...	8	0	156	6	
		Red clay ...	1	0	157	6	
		White sandstone ...	15	0	172	6	
		Red sandstone ...	3	0	175	6	
		White sandstone, containing much water ...	2	0	177	6	
		White sandstone ...	11	0	188	6	
		Red sandstone ...	42	0	230	6	



No.	Location of Boring. — Parish.		STRATA PASSED THROUGH.				Remarks.
			Description.	Thickness.		Depth to Base.	
		Ft.		in.	Ft.	in.	
52	York City	...	Clay and stones...	...	24	0	Walmgate
		...	Quicksand	...	60	0	
		...	Sandstone, fine	...	204	0	
		...	Parting with water	...	0	2	
		...	Sandstone, fine	...	279	0	
53	Dunnington (East Riding)	...	Top soil	...	1	6	(1903)
		...	Soft sand	...	4	6	
		...	Sharp sand	...	2	0	
		...	Sand and gravel full of water...	...	7	6	
		...	Dark coloured clay	...	2	6	
		...	Strong blue clay with large boulders in	...	6	6	
54	Naburn (East Riding)	...	Top soil	...	4	6	New cottages, 1894. (Water level 10 feet from surface)
		...	Red clay	...	7	6	
		...	Sand and gravel	...	5	0	
		...	Red clay	...	10	0	
		...	Boulder clay	...	14	0	
		...	Blue clay	...	29	0	
		...	Red sand	...	12	0	
		...	Light sandy greystone, very soft	...	18	0	
		...	Grey sandstone	...	60	0	
55	Naburn (East Riding)	...	Warp clay	...	20	0	Naburn Lock, 1894. (Water level 6 feet from surface)
		...	Dark clay	...	20	0	
		...	Stronger clay	...	6	0	
		...	Sand and gravel	...	7	0	
		...	Warp clay with bands blue marl	...	11	0	
		...	Red sand	...	16	0	
		...	Soft, light, sandy greystone	...	24	0	
		...	Grey sandstone	...	56	0	
56	Riccall (East Riding)	...	Sand	...	9	0	1889
		...	Clay	...	4	0	
		...	Grey sand	...	16	0	
		...	Blue clay	...	33	0	
		...	Red clay	...	9	0	
		...	Warp	...	4	0	
		...	Marly stone	...	32	0	
		...	Red marl	...	1	0	
		...	Marly stone	...	33	0	
		...	Red marl	...	7	0	
		...	Marly stone	...	6	0	
		...	Red sandstone	...	20	0	
		...	Marl	...	3	0	
		...	Red sandstone	...	51	0	
57	Osgodby (East Riding)	...	Drift 25 ft. { Loamy soil	...	2	0	
		...	Clay	...	4	0	
		...	Sand	...	4	0	
		...	Clay	...	15	0	
		...	Red sandstone	...	175	0	
58	Cliff Common (East Riding)	...	Warp clay	...	40	0	Maltkiln, 1902  (Water level 10 feet from surface)
		...	Grey sand	...	12	0	
		...	Strong clay	...	16	0	
		...	Grey sand	...	10	0	
		...	Soft grey sandstone	...	88	0	

No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.			
		Description.	Thickness.		Depth to Base.				
			Ft.	in.	Ft.	in.			
59	Crowle (Linc.)	...	Blue Clay	...	60	0	60	0	New Trent Brewery (Water level 5 feet from surface)
		...	Rock, water and alabaster	...	2	6	62	6	
		...	Clay	...	15	0	77	6	
		...	Rock	...	5	0	82	6	
		...	Clay	...	15	0	97	6	
		...	Rock	...	5	0	102	6	
		...	Clay	...	15	0	117	6	
		...	Rock	...	5	0	122	6	
		...	Clay	...	15	0	137	6	
		...	Rock	...	2	6	140	0	
		...	Clay	...	5	0	145	0	
60	Crowle (Linc.)	...	Sand	...	10	0	10	0	(Good supply of good water, 1887)
		...	Gravel	...	3	0	13	0	
		...	Water stone	...	114	0	127	0	
61	Finningley (Notts.)	...	Clay	...	10	0	10	0	Bank End, 1902. (Good supply of good water)
		...	Sand, fine	...	17	0	27	0	
		...	Sandstone, with little limestone	...	59	0	86	0	
62	Garthorpe (Linc.)	...	Sand	...	17	0	17	0	(Good supply of good water, 1890)
		...	Sandstone	...	12	0	29	0	
		...	Sand, soft	...	11	0	40	0	
		...	Sandstone and gravel	...	32	0	72	0	
63	Southcar (Linc.)	...	Soil	...	1	6	1	6	Mineral bore continued to 3186 feet, but excellent water was found between 740 feet and 1018 feet.
		...	Sand	...	8	0	9	6	
		...	Sand and clay	...	6	6	16	0	
		...	Sandy clay	...	3	6	19	6	
		...	Sand	...	9	0	28	6	
		...	Sandy clay	...	0	6	29	0	
		...	Sand and gravel	...	3	0	32	0	
		...	Marl, red and blue	...	3	0	35	0	
		...	„ „ with gypsum	...	10	6	45	6	
		...	Sandstone, grey...	...	1	0	46	6	
		...	Limestone, grey...	...	1	6	48	0	
		...	Marl, red and blue, sandy with gypsum	...	40	7	88	7	
		...	Marl, red and blue, with gypsum	...	4	0	92	7	
		...	„ blue, with gypsum	...	15	0	107	7	
		...	„ red and blue, with gypsum and sandstone	...	24	0	131	7	
		...	„ red	...	6	0	137	7	
		...	Sandstone, red and grey	...	105	8	243	3	
		...	„ „ with marl	...	30	11	274	2	
		...	„ „	...	158	1	432	3	
		...	„ „ with blue shale	...	34	0	466	3	
		...	Sandstone, red and grey	...	15	0	481	3	
		...	„ „ „ with shale and marl	...	98	4	579	7	
		...	Sandstone, red and grey	...	13	0	592	7	
		...	„ „ „ with shale and marl	...	78	1	670	8	
		...	Sandstone, red	...	75	6	746	2	
		...	„ „ with pebbles	...	206	10	953	0	
		...	„ „ „ and marl	...	10	0	963	0	
		...	„ „ with pebbles	...	55	1	1018	1	
		...	„ „ with marl	...	11	6	1029	7	
		...	„ „	...	35	5	1065	0	
...	„ „ with marl	...	115	6	1180	6			
...	Marl, red, and grey with gypsum	...	1	0	1181	6			

—Tubed with 8½ in. tubes to 639 feet. Unlined from 639 to 978 feet. Tubed from 978 to 1149. Borehole plugged at 1149 feet. (Water level 8 feet from surface).



No.	Location of Boring. — Parish.	STRATA PASSED THROUGH.				Remarks.				
		Description.	Thickness.		Depth to Base.					
			Ft.	in.	Ft.		in.			
64	Gainsborough (Linc.)	Marl ...	709	0	709	0	Town's supply. (Pump fixed 300 feet below surface)			
		Light red marl ...	16	0	725	0				
		Very fine red sandstone ...	25	0	750	0				
		Coarser „ „ ...	50	0	800	0				
		Fine „ „ ...	20	0	820	0				
		Red marl ...	10	0	830	0				
		Light red sandstone and pebbles	40	0	870	0				
		Red marl ...	10	0	880	0				
		Light red sandstone ...	26	0	906	0				
		Red marl ...	5	0	911	0				
		Light red sandstone ...	19	0	930	0				
		Micaceous sandstone with pots of marl ...	20	0	950	0				
		Light red sandstone with pebbles	10	0	960	0				
		Sandstone with marl pots ...	28	0	988	0				
		Sandstone and pebbles ...	50	0	1038	0				
		Coarse sandstone ...	75	0	1113	0				
		„ „ with pebbles	25	0	1138	0				
		Fine sandstone with hard beds	50	0	1188	0				
		Coarse sandstone ...	44	0	1232	0				
		Sandstone, with pebbles ...	31	0	1263	0				
		Fine red sandstone ...	16	0	1279	0				
		Marl ...	7	0	1286	0				
		Coarse red sandstone ...	26	0	1312	0				
		Red sandstone with pebbles ...	125	0	1437	0				
		Fine sandstone ...	50	0	1487	0				
		„ „ with marl pots	28	0	1515	0				
65	Scunthorpe (Linc.)	Soil ...	1	0	1	0	Quantity of water ample, but highly charged with mineral matter			
		Running sand ...	20	3	21	3				
		Rhaetics ...	0	10	22	1				
		Keuper marls ...	863	11	886	0				
		Grey sandstones ...	4	0	890	0				
		Keuper sandstones ...	367	0	1257	0				
		Red and blue marls ...	7	0	1264	0				
		Red sandstones ...	203	0	1467	0				
		„ „ (Bunter with pebbles)	300	6	1767	6				
66	East Retford (Notts.)	Soft red marl and sandstone ...	11	6	11	6	Coal Company ...			
		Red and grey marlstone and grey pumice ...	30	6	42	0				
		Red sandstone ...	123	0	165	0				
		Grey and red marl ...	3	0	168	0				
		Red sandstone ...	92	6	260	6				
		Red sandstone and gravel ...	1	6	262	0				
		Red sandstone ...	220	0	492	0				
		Red marl and gravel ...	1	6	493	6				
		Red sandstone ...	142	6	636	0				
		Pebbles or conglomerate ...	8	0	644	0				
		Red sandstone ...	70	0	714	0				
		Red marl ...	3	0	717	0				
		Red sandstone ...	69	0	786	0				
		Red and grey marl mixed with red and white sandstone ...	99	0	885	0				
		Red marl and limestone ...	7	0	892	0				
		67	Scarle (Notts.)	River gravel ...	21	0		21	0	
				Lias clay and limestone ...	29	0		50	0	
Rhaetic shales and sand stones	15			0	65	0				
Keuper marls with gypsum ...	688			0	753	0				
Keuper sandstones (water bearing) ...	205			6	958	6				
Bunter pebble beds ...	318			6	1277	0				
Lower bunter, marl, &c. ...	223			0	1500	0				
Permian, 519 feet.	Marls ...			118	6	1618	6			
	Magnesium Limestone ...			43	6	1662	0			
	Marl and sandstone ...			150	0	1812	0			
	Magnesium Limestone ...			68	0	1880	0			
	Sand stone ...			20	0	1900	0			
	Marl slates ...			118	0	2018	0			
	Coarse Grit and Breccia...			1	0	2019	0			
Coal measure shales ...	12			0	2031	0				

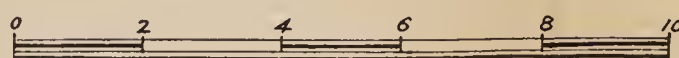




# SKETCH GEOLOGICAL MAP OF THE EASTERN PORTION OF THE WEST RIDING OF YORKSHIRE.

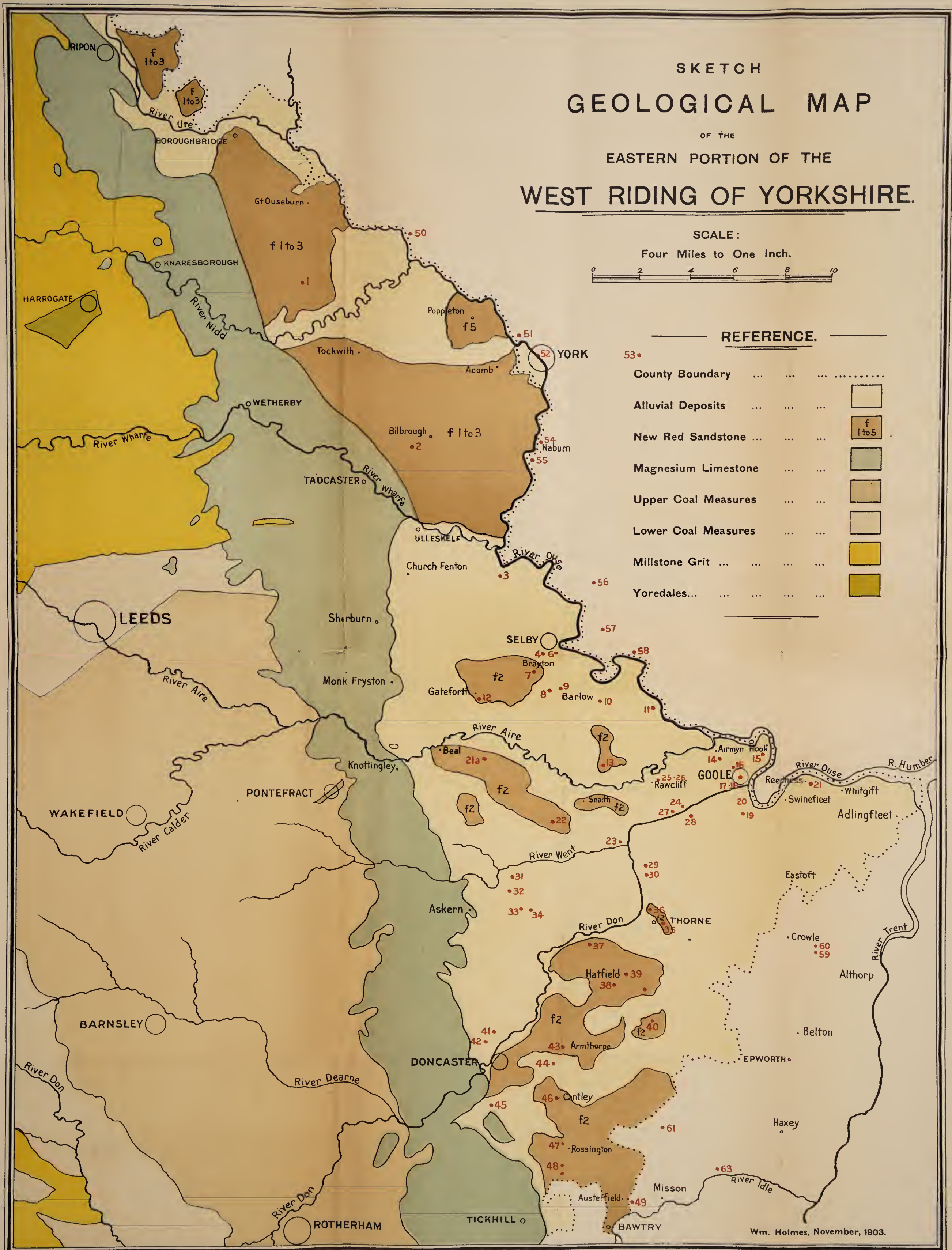
SCALE:

Four Miles to One Inch.



## REFERENCE.

County Boundary	...	...	...	...
Alluvial Deposits	...	...	...	...
New Red Sandstone	...	...	...	f 1 to 5
Magnesium Limestone	...	...	...	...
Upper Coal Measures	...	...	...	...
Lower Coal Measures	...	...	...	...
Millstone Grit	...	...	...	...
Yoredales...	...	...	...	...



Wm. Holmes, November, 1903.



